White Paper

Surge Protection:
New Life Safety Requirements

Part 1 of 2

ASCO®

SURGE PROTECTION: NEW LIFE SAFETY REQUIREMENTS

When facility executives think of surge protective devices (SPDs), the first thing that probably comes to mind is protecting sensitive electrical equipment from surges. Most facility executives are familiar with the importance of SPDs in protecting computers, servers, and other IT equipment, as well as the plethora of wired hubs for Building Internet of Things devices.

However, the 2014 and 2017 editions of the National Electrical Code (NEC®) recognize that many disparate building systems are necessary to protect life and safety, including emergency lighting, access control, fire alarms, communications, and even elevators and escalators. Emergency electrical power to these essential systems must also be protected from surges caused by fire, weather events, accidents, utility switching, and even the on-off switching of high-powered equipment inside a facility. Despite new code requirements, many facility executives have not fully recognized potential impacts of surges to their life safety systems. A recent ASCO Surge Protection (ASCO)/Building Operating Management (BOM) survey showed that only 50 percent of respondents identified life safety risks as a potential impact of surges.

What impacts do you think a power surge from a nearby lightning strike or other sources could have on your facility?

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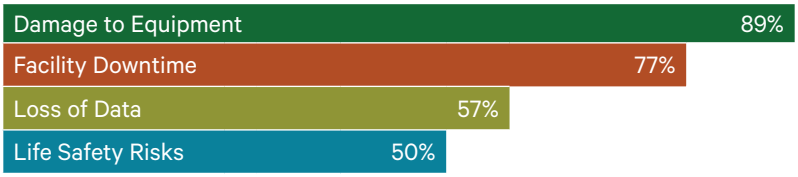


Surge Defined

People sometimes inadvertently misuse the term "power surge," applying it to all sorts of power disturbances, not just to transient overvoltages. For example, when lights went out during the 2013 Super Bowl, announcers called it a "power surge." But it was not a surge and could not have been prevented by an SPD.

A surge or transient is an overvoltage that lasts less than a half-cycle of the normal voltage waveform, notes the National Electrical Manufacturers Association's (NEMA) Surge Protection Institute website. The surge can have positive or negative polarity, will add to or subtract from the normal voltage waveform, and generally is oscillatory and decaying over time.

Electrical equipment is designed to handle nominal variations in normal operating voltage. When electrical engineers design a facility's surge suppression system, they often use a layered or tiered protection strategy. The first line of defense often is a large high-current SPD that is connected at the utility service input. This SPD will divert the largest surges and is generally the best equipped to handle very high overvoltage situations. Medium-sized protectors are connected at electric panels to limit overvoltages within a building's branch circuits. Smaller SPDs protect critical equipment and plug-in receptacles from voltage transients, including transients generated within a facility.

Damage, Downtime Understood as Big Risks

Facility executives know that surges from internal and external sources may damage equipment, resulting in downtime, expensive repairs, and business interruption — all important factors to consider when assessing the value of SPDs. In the ASCO/BOM survey, 89 percent of respondents identified damage to equipment as an impact of power surges.

Facility executives are rightfully concerned when it comes to the risks posed by surges. While surges are not the only power quality problem that facilities experience, surges "cause data corruption and catastrophic equipment damage as well as incremental damage that degrades equipment performance and shortens its useful lifespan," points out Ron Mojica, Senior Associate at CallisonRTKL.

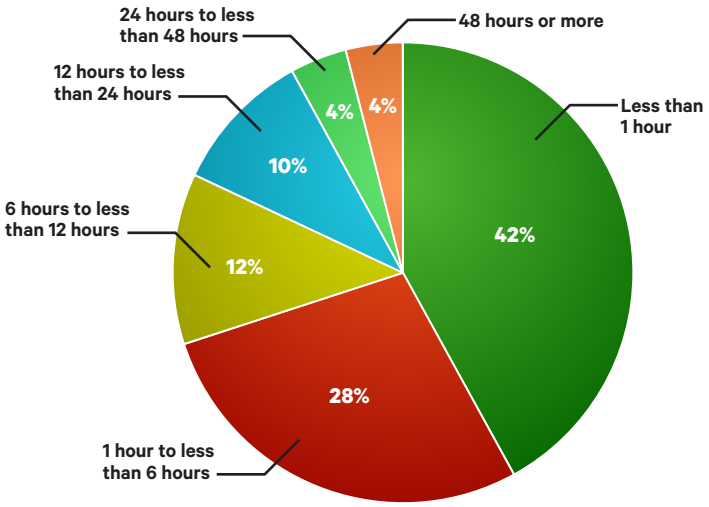
"[Surges] tend to be temporary in nature and of sufficient magnitude to severely damage electronic equipment," says Erika Bolger, Senior Electrical Engineer at McGuire Engineers.

The ASCO/BOM survey shows that most facility executives have first hand experience with the damaging impact of power surges, with 52 percent reporting such equipment damage at least once in the past three years.

Jim Ballengee, Director of Facilities and Engineering for City of Hope Medical Center, considers the main primary risk to be "damaging equipment," which can result in downtime and inaccurate medical information. He says that even when equipment isn't destroyed, the wear and tear from surges can shorten its useful life. Steven Tobias, Director of Buildings/Grounds and Safety at the Tippecanoe School Corporation, has seen damage to equipment and feeder conductors.

Facility downtime is another major concern — 77 percent of the respondents to the ASCO/BOM survey mentioned that risk. Asked about the amount of downtime they attributed to power surges, 30 percent reported downtime of six hours or more, including 4 percent who put downtime at 48 hours or more.

System downtime presents both primary and secondary concerns. Phil Koth, Chief Engineer at Transwestern, says that he is concerned with "equipment downtime, primarily." "Sometimes we have to go around the building resetting equipment from surges," says Chuck Klinger, Lead Engineer at Foulger-Pratt Management.



What was the total amount of downtime that resulted from power surges?

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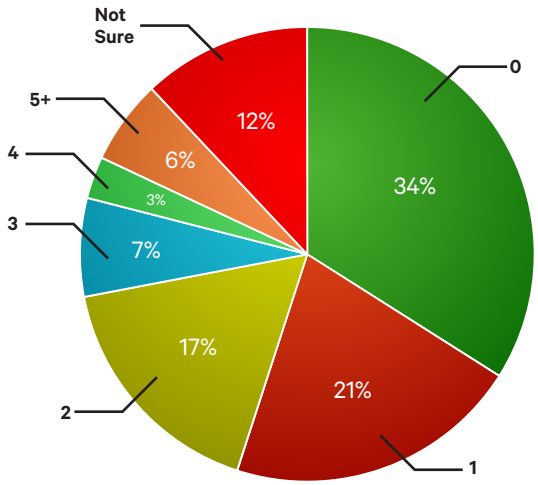

How many times has your organization experienced equipment damage from power surges in the past 3 years?

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Digital Devices at Risk

Thanks to the Internet of Things penetration into facilities today, microprocessors are everywhere. Static electricity at levels well below human perception can cause sensitive electronic equipment to malfunction, leading to data corruption and even equipment lock-ups.

Nicholas Stolatis, Vice President at EPN Real Estate Services, is concerned with surges "frying electronics that are connected. A secondary risk is the electronic device is knocked off-line and not doing its job," he says.

Bill Cronin, Facility Superintendent of Missouri City, Texas, explains that protecting important data was one reason SPDs were installed when the city's large data center was updated about eight years ago. "We also have SPDs at outlying facilities to protect radio and data operations," Cronin says.

"With the influx of digital devices, which rely heavily on sophisticated modern electronic components, SPDs are more important than ever in the electrical distribution system," says Mojica. Modern digital devices often are more delicate than older equipment, which makes them more sensitive to power surges.

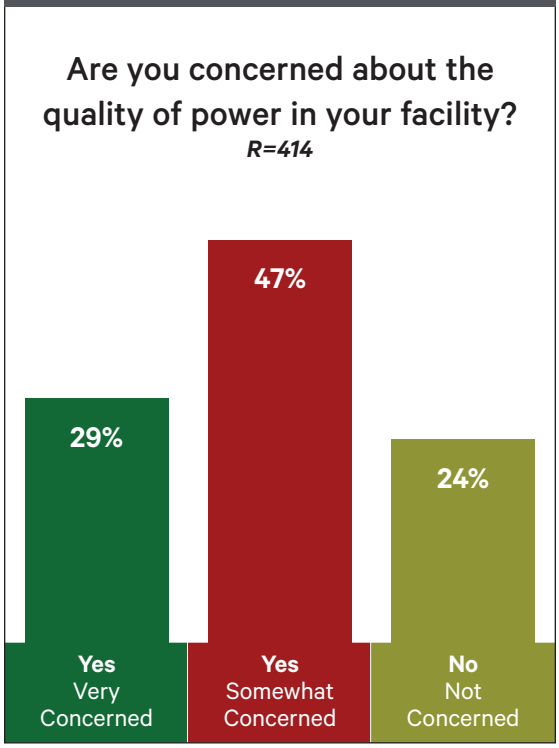
Preventing Costly Damage

Surge protection devices prevent costly equipment from being damaged by surges. Not only do SPDs protect the initial investment in the equipment, but they also prevent the loss of revenue that would have occurred in the event of equipment outage or downtime of a facility, explains Bolger. That's why sensitive medical equipment such as CT scanners or MRIs in hospitals are protected by SPDs, as are servers for banks, trading companies, and data centers.

Some facility executives have attempted to quantify the costs of power surges to their organizations. In the ASCO/BOM survey, 56 percent put the cost of repairing or replacing damaged equipment at between $5,000 and $50,000.

Power Quality is a General Concern

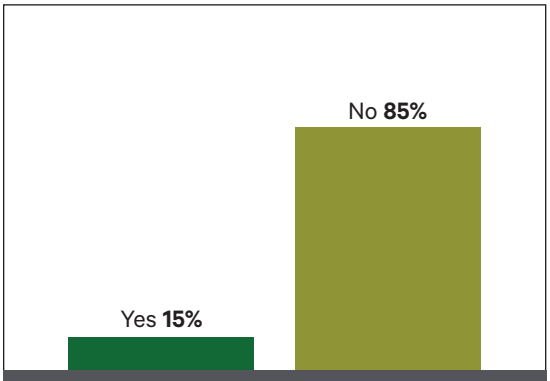
Most facility executives are concerned about power quality issues in their buildings. In the ASCO/BOM survey, 76 percent said that they are very concerned or somewhat concerned about the quality of power in their facilities.



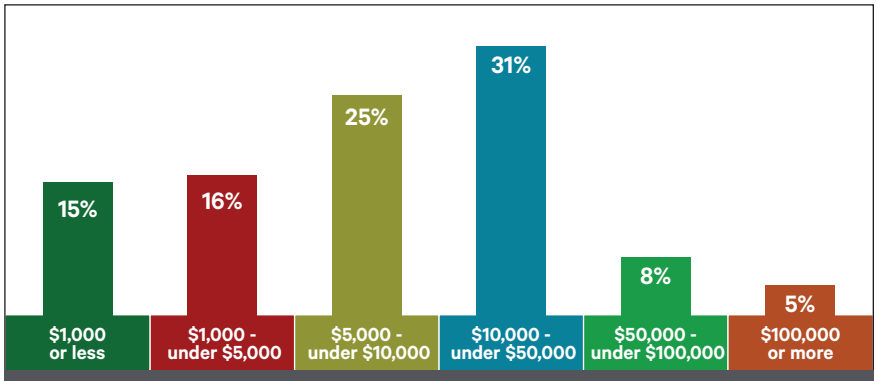
Many school buildings in the Tippecanoe district have installed SPDs on distribution panels. Tobias reports that schools have experienced "damage to motor control circuits and electrical distribution equipment" because of voltage transients. He recalls that one surge "caused three days of downtime" for affected systems.

To avoid medical equipment failures, Ballengee says his hospital has installed SPDs "throughout the operating rooms and on all IV poles."

Life safety equipment also needs SPD protection from voltage transients. A fire increases the possibility of power loss, as does a lightning storm. If life safety equipment is unprotected, voltage transients could damage a fire alarm system protecting the building and its occupants. Community safety and protection can also be compromised should a loss of communication systems prevent proper dispatch of fire and police resources.



Have you ever attempted to quantify the cost of power surges on your organization? R=419



What was the total cost to repair or replace the equipment damaged because of voltage surges? R=61

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